1. (Currently Amended) A brushless hybrid electrical machine for converting between electrical and mechanical energy comprising:

a rotor supported for rotation about an axis of rotation relative to a juxtaposed stator that is stationary and magnetically interacts with said rotor;

said rotor includes a ferromagnetic rotor structure having poles around a circumference, said poles arranged in a circumferentially alternating array of ferromagnetic and permanent magnet poles;

said ferromagnetic and permanent magnet poles facing a magnetic air gap created in said ferromagnetic structure;

said stator having a stationary air core armature located in said magnetic air gap, said air core armature comprising windings;

said ferromagnetic rotor structure having co-rotating ferromagnetic portions on both sides of said stationary air core armature for conducting magnetic flux to said magnetic air gap and thence through said armature in said magnetic air gap;

said stator including a field coil that generates field coil flux that flows in a flux path through said co-rotating ferromagnetic rotor portions and said ferromagnetic poles, said magnetic air gap and through said ferromagnetic rotor structure;

said permanent magnet poles generate permanent magnet flux;

whereby said field coil flux and said permanent magnet flux induces an AC voltage in said windings of said air core armature as said rotor rotates.

2. (Original) A brushless hybrid electrical machine as described in claim 1 wherein:

said permanent magnet flux flows mostly axially and radially through said ferromagnetic rotor structure when the field current to said field coil is off and when said field current has a polarity such that said field current bucks said induced AC voltage in said multiple phase windings of said air core armature.

3. (Original) A brushless hybrid electrical machine as described in claim 2 wherein:

said electrical machine is free of laminations.

4. (Currently Amended) A brushless hybrid electrical machine for converting between electrical and mechanical energy comprising:

a rotor supported for rotation about an axis of rotation relative to a juxtaposed stator that is stationary and magnetically interacts with said rotor;

said rotor includes a ferromagnetic rotor structure having poles around a circumference, said poles arranged in a circumferential array of ferromagnetic and permanent magnet poles;

said ferromagnetic and permanent magnet poles facing a magnetic air gap created in said ferromagnetic structure;

said stator having a stationary air core armature located in said magnetic air gap, said air core armature comprising windings;

said stator including a field coil that generates field coil flux that flows in a flux path through said ferromagnetic poles, said magnetic air gap and through said ferromagnetic rotor structure;

said permanent magnet poles generate permanent magnet flux, said permanent magnet flux flows in a path primarily excluding said ferromagnetic poles when said field coil is off ;

whereby said field coil flux and said permanent magnet flux induces an AC voltage in said windings of said air core armature as said rotor rotates.

5. (Canceled)

6. (Currently Amended) A brushless hybrid electrical machine as described in claim ~~5~~ 4 wherein:

application of current to said field coil bucks or boosts the AC voltage induced in said windings depending on the polarity of the current to said field coil.

7. (Currently Amended) A brushless hybrid electrical machine as described in claim ~~5~~ 4 wherein:

said brushless hybrid electrical machine converts between electrical and mechanical energy in a flywheel energy system.

8. (Original) A brushless hybrid electrical machine as described in claim 4 wherein:

said rotor comprises a magnetic insulating structure that separates two portions of said ferromagnetic rotor structure such that each portion bounds opposite sides of said magnetic airgap.

9. (Currently Amended) A brushless hybrid electrical machine for converting between electrical and mechanical energy comprising: a rotor supported for rotation about an axis of rotation relative to a juxtaposed stator that is stationary and magnetically interacts with said rotor;

said rotor includes a ferromagnetic rotor structure having poles around a circumference, said poles arranged in a circumferential array of ferromagnetic and permanent magnet poles;

said ferromagnetic and permanent magnet poles facing a magnetic air gapdefined between co-rotating portions of said rotor;

said stator having a stationary air core armature located in said magnetic air gap, said air core armature comprising windings;

said brushless hybrid electrical machine further comprising a field coil that generates field coil flux that flows in a flux path through said ferromagnetic poles, said magnetic air gap and through said ferromagnetic rotor structure; said permanent magnet poles generate permanent magnet flux;

whereby said field coil flux and said permanent magnet flux induces an AC voltage in said windings of said air core armature as said rotor rotates.

10. (Original) A brushless hybrid electrical machine as described in claim 9 wherein:

said magnetic airgap is bounded on both sides by rotating surfaces of said rotor.

11. (Original) A brushless hybrid electrical machine as described in claim 10 wherein:

said brushless hybrid electrical machine comprises only a single magnetic airgap.

12. (Original) A brushless hybrid electrical machine as described in claim 11 wherein:

said field coil is supported by said rotor.

13. (Original) A brushless hybrid electrical machine as described in claim 11 wherein:

said field coil is supported by said air core armature.

14. (Original) A brushless hybrid electrical machine as described in claim 10 wherein:

said circumferential array of ferromagnetic and permanent magnet poles comprises a circumferential alternation of permanent magnet and ferromagnetic poles.

15. (Original) A brushless hybrid electrical machine as described in claim 10 wherein:

said circumferential array of ferromagnetic and permanent magnet poles comprises a circumferential array of alternating polarity of permanent magnet poles.

16. (Original) A brushless hybrid electrical machine as described in claim 15 wherein:

said permanent magnet flux flows primarily between said alternating polarity permanent magnet poles in said rotor.

17. (Original) A brushless hybrid electrical machine as described in claim 15 wherein:

said ferromagnetic poles are located adjacent permanent magnet poles of one polarity.

18. (Original) A brushless hybrid electrical machine as described in claim 15 wherein:

said alternating polarity permanent magnet poles are arranged such that one polarity of permanent magnet pole has a shorter circumferential length than the other.

19. (Original) A brushless hybrid electrical machine as described in claim 10 wherein:

said permanent magnet poles are located on both sides of said magnetic airgap.

20. (Original) A brushless hybrid electrical machine as described in claim 9 wherein:

said air core armature is wound such that AC voltage induced in said windings is sinusoidal.